(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 082 723**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 82306844.0

(22) Date of filing: 21.12.82

(51) Int. Cl.³: E 06 B 9/264

(30) Priority: 21.12.81 US 332812
02.08.82 US 404468
09.11.82 US 440295

(43) Date of publication of application:
29.06.83 Bulletin 83/26

(84) Designated Contracting States:
BE DE FR IT NL SE

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(54) **Tilting transfer mechanism for a Venetian blind assembly.**

(57) A tilting transfer mechanism for a venetian blind assembly, particularly between the panes (3,4) of a double glazing unit and having a plurality of slats (10), at least one tape cable (12) forming part of supporting means, supporting said slats, pivotel upper and lower hanger members (15, 16) supporting each tape cable, upper and lower bearing elements (20) pivotally supporting said upper and lower hanger members respectively, a linearly movable operating element such as a magnet (21) and connecting means (22) operatively connecting said linearly movable operating element with said hanger members, whereby linear movement of said operating element will cause said hanger members to pivot on said bearing elements to tilt said slats and a magnetic actuating member (23) movement of which will cause movement of said operating element (21) and thus tilting the slats.

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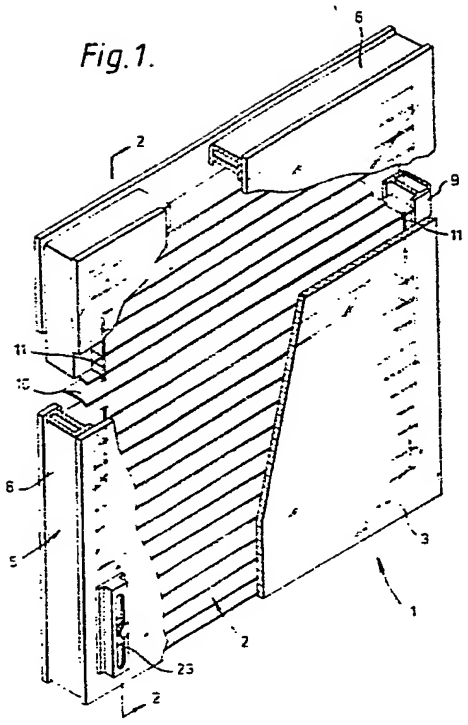
Fig.1.



DESCRIPTION

TITLE: A TILTING MECHANISM FOR A VENETIAN BLIND

The present invention relates to a tilting transfer mechanism for a venetian blind assembly which may, for example, be positioned behind glazing, for example, between the two panes of double glazing.

Venetian blind assemblies have been proposed which have been positioned in a number of different ways relative to window units. For example, the blind assembly may be adjacent a single pane of glass or between two panes, or even positioned in a triple glazing unit. In use having two or more panes, the assemblies may be positioned within a unit which is provided with a hermetic seal between the panes and the frame to provide a superior insulation. In all forms of units, including single and multiple pane constructions, and unsealed and hermetically sealed constructions, it is desirable to have a single effective tilting transfer mechanism by which the tilt of the individual slats of the blind assembly may be easily and accurately regulated using a minimum of force, and where the degree of force necessary to tilt the slat remains substantially uniform during the complete range of tilting.

It is also desirable in order to facilitate placement of the venetian blind in a window unit, that it should be fully reversible in a window opening, i.e. with the top and bottom ends of the blinds reversible in the unit or at least the top and bottom ends are interchangeable. This feature requires a tilting transfer mechanism which may work equally in either position of

the blind.

Further, it is desirable in window units having two or more spaced panes that the slats of the blind assembly in the open position occupy as much of the space between the panes as possible in order to reduce expense of blind assembly and to reduce operating forces. If slats were used where the width of the slat is substantially less than the space between the panes, more slats would be required completely to close the window opening thus increasing the cost and the force necessary to effect tilting.

A problem with many hermetically sealed units has been the difficulty of providing control exterior of the window unit by which the tilting of the slats may be regulated while at the same time preserving the integrity of the sealed unit. Controls extending through the frame will, after use, increase the difficulty of maintaining a seal.

Magnetic couplings have been proposed for hermetically sealed window units to connect an actuating member exterior of the unit to a blind operating element in the interior unit as can be seen for example from United States Patent No. 3,022,549 and 3,129,471. The problem with such couplings has been to design one which is small in size and which will, at the same time, have sufficient coupling strength to enable the slat of the blind to be tilted throughout their complete range.

It is now proposed, according to the present invention, to provide a tilting transfer mechanism for a venetian blind assembly having a plurality of slats, at least one tape cable forming part of supporting means supporting said slats, pivotal upper and lower hanger members supporting each tape cable, upper and lower bearing elements pivotally supporting said upper and lower hanger members respectively, the tilting transfer

means including a linearly movable operating element and connecting means operatively connecting said linearly movable operating element with said hanger members, whereby linear movement of said operating element will cause said hanger members to pivot on said bearing element to tilt said slats.

The concept of the invention is thus to have the slats tiltable by acting directly on at least one of the hanger members or on the slat supporting means. This gives the advantage of limiting the number of parts required for the blind construction and its tilting operating means. While the hanger members may be separate from the top and bottom slats, so that the slats of the assembly can all be substantially the same, it is also possible for the hanger members to form part of or be in the form of a spare top or bottom salt which will normally be of slightly heavier construction. The hanger member construction itself does not form part of the invention.

The tape cable may form part of the connecting means and these may include flexible elements, or pivotally mounted rigid linear elements, connecting the operating element with the tape cable. the flexible elements may be connected to the tape cable and the operating element at such points that they cross in a vertical plane, so that they may be hidden behind the linearly movable operating element.

In an alternative arrangement, the connecting means may comprise, in part, a separate drive cable connected to the upper and lower tape hanger members and to the linearly movable element either directly or via the tape cables. In such a construction the drive cable may engage a surface of the hanger member spaced from the pivot axis of the hanger member and include, in addition, a drive cable guide for guiding the drive cable near the hanger member to maintain constant tension in the complete drive cable including the portion of the drive cable on the side of the operating element in the direction of linear movement of the operating element.

With this arrangement, the guide may comprise a saddle-shaped wire hanger having two spaced parallel

upstanding portions with one of the portions forming a guide arm, and the other of the portions forming a bearing support from one of the hanger elements.

Preferably the operating element has a guide means extending in a direction transverse to the direction of linear movement of the operating element, the connecting means including a slider which is slidable in the guide means, whereby the connecting elements may move in a direction transverse to the linear movement of the operating element during operation of the mechanism. This is an alternative to the flexible arrangement, and ensures both that the tape cable is not distorted, thus distorting the slats and that the tape cable is capable of moving away from the pane of glass when the slats are moved to the tilted position. This is particularly advantageous where the operating mechanism is magnetic because it does not reduce the magnetic coupling as will be explained below.

If the blind assembly forms part of the window unit including a pane, the operating element is preferably slidable in a linear direction on one side of the pane and an actuating member is linearly slidable on the opposite side of the pane from the operating element and is coupled with the operating element. Particularly if the pane forms part of a hermetically sealed window unit, with the venetian blind positioned within the window unit, the operating element is advantageously magnetically coupled with the actuating member. This may be achieved by the operating element and the actuating member each including one or more magnets therein and the operating element may include an inner housing containing at least one magnet with the inner housing being connected to the connecting means and the actuating member including an outer housing containing at least one further magnet.

A guide may be fixed to the window unit and the outer housing containing the actuating member with the magnets therein being able to slide in the guide. IN an alternative arrangement, a stroke limiter in the form of a bar is affixed to the window unit and the actuating member is positioned adjacent and movable with respect to the stroke limiter, stop means on the actuating member limiting movement of the actuating member with respect to the stroke limiter, which is, preferably, positioned between the magnets of the actuating member.

The operating element may itself comprise a split housing which forms two similar housing sections, each housing section having at least one magnet therein, and the housing being connected between the sections in the connecting means. With this arrangement, the split housing is preferably formed by a notch in the housing on a side thereof facing the slats. In this way, the housing may have an upwardly extending vertical arm and a downwardly extending vertical arm, each connected by one of its ends to the housing and between the two sections each connected at the other of its ends to the connecting means, more normally the tape cable of the ladder tape of the venetian blind. Each housing section preferably comprises a band which engages an edge of a magnet, the band having a shoulder on a portion thereof having a side engaging a face of a magnet and having, in addition, a pole piece engaging on the opposite side of this shoulder from the side engaging the face. In this way, the pole piece is magnetically attracted to the magnet, such that the shoulder holds the magnet and the pole piece in place in the band and no other means are required to hold the magnets in place. Preferably the pole piece has a groove in it to receive and locate the shoulder.

Like the operating element, the actuating member

may also comprise a split mounting having two similar mounting sections substantially equal in size to the two housing sections, each mounting section containing at least one magnet therein with a magnet in the housing section being magnetically coupled with a magnet in the mounting section. Preferably, each housing and each mounting section has several magnets vertically arranged therein, with the number of magnets in the housing section being equal to the number of magnets in the mounting section. The polarity of the magnets at one vertical level of one housing section may then be opposite to the polarity of the magnet in the same vertical level in the other housing section, while the polarity of a magnet in one vertical level in one housing section is opposite to the polarity of a magnet in the same vertical level in the mounting section to which the magnet in the housing section is magnetically coupled. This ensures that there is little tendency for the actuating member to cause any tilting movement of the operating element.

Advantageously, the operating element within the double glazing unit includes an inner housing having tie points at the top and bottom sides thereof connecting the housing part of the connecting means.

Over at least a part of the linear movement of the operating element the slats preferably have one or more cut-outs therein to receive the operating element, or part thereof, the remainder of the slats having no such cut-outs and therefore being solid. This enables the operating element to be moved further inwardly. In this case the slats which do have cut-outs are preferably provided with two cut-outs and these slats are secured by securing means to the tape cable at the widest portion thereof between the cut-outs. The operating element may then be connected to the tape cable, the

tape cable forming part of a tape ladder which has a plurality of upper rungs and lower rungs which support the slats, means being provided which are associated with some of the slats for holding the upper and lower rung to the top and bottom surface of a slat adjacent a cut-out formed in the edge of the slats with the cut-outs. The widest portion of each slat having cut-outs may have a notch on the edge thereof to receive a tape cable.

The means associated with some of the slats may comprise a pad engaging the surface of a portion of a slat extending between the cut-outs with a pad having a rung engaging surface including a groove portion and a slat engaging surface thereon, a pad fixing means fixing the pad to the surface of the slat whereby the groove portion will engage a rung to prevent longitudinal movement of the slat with respect to the tape ladder. The pad fixing means may then include a locking member which extends through an aperture in the widest portion of the slat which has cut-outs, whereby the tape support pad is affixed to a surface of the slat and the fixing means includes a notch for engaging that rung of the double rung arrangement which is opposite the rung which is engaged in the groove portion, such that the tape support pad spreads the upper and lower rungs engaged thereby to tension these rungs whereby they are securely held in the groove portion and in the notch portion.

In order that the invention may more readily be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings, in which:-

Figure 1 is a broken perspective view of a window unit provided with a venetian blind assembly including an embodiment of transfer mechanism according to the invention;

Figure 2 is a cross-sectional view of the window unit of Figure 1 taken along the lines 2-2 illustrating one embodiment of a connection between a tape cable and an operating element;

Figure 3 is a cross-sectional view of a second embodiment of a connection between a tape cable and an operating element;

Figure 4 is a cross-sectional view of a third embodiment of a connection between a tape cable and an operating element;

Figure 5 is a cross-sectional view of the connection of Figure 4 taken along the line 5-5 thereof;

Figure 6 is a perspective view of the connection of Figure 4 securing sliders to a tape cable;

Figure 7 is a cross-sectional view of an operating element in the form of a housing enclosing magnets connected to a tape cable and illustrates a further embodiment of connection of a tape cable with an operating member;

Figure 8 is an enlarged perspective view of a modified form of a linear movable operating element constructed according to the invention and having a split housing;

Figure 9 is a perspective view illustrating the use of integral tabs for securing a slat to a tape cable or other connecting means;

Figure 10 is a perspective view of a further embodiment of connection in the form of a tape support pad prior to application of a slat;

Figure 11 is a view similar to Figure 10 illustrating the tape support pad applied to a slat;

Figure 12 is a view similar to Figure 11 illustrating the rear side of the tape support pad and the manner in which it spreads the rungs of a ladder tape;

Figure 13 is a perspective view of a still further form of connection;

Figure 14 is a perspective view of a further form of operating element connected to a tape ladder;

Figure 15 is a further view of the operating element of Figure 14;

Figure 16 is an enlarged sectional view of a portion of the operating element of Figure 15;

Figure 17 is an exploded perspective view of an operating element, stroke limiter and actuating member of an assembly according to the invention;

Figure 18 is a diagrammatic view illustrating placement of magnets in the operating element of Figure 17;

Figure 19 is a diagrammatic view illustrating placement of magnets in the actuating member of Figure 17; and

Figure 20 is a diagrammatic view of the arrangement of magnets of the operating element with respect to the magnets of the actuating member of Figure 17.

Referring to Figures 1 and 2, there is illustrated a window unit 1 comprising a venetian blind assembly 2 positioned between a front pane of glass 3 and a rear pane of glass 4. Panes 3 and 4 may be sealed with respect to a frame 5, which comprises horizontal upper and lower members 6 and 7 respectively and vertically extending side members 8 and 9 to form a hermetically sealed window unit.

The venetian blind assembly 2 comprises a plurality of slats 10 (Figure 2) contained within two tape ladders 11. Each tape ladder 11 comprises two tape cables 12 having a plurality of upper rungs 13 and lower rungs 14 extending therebetween with the slats 10 being supported between upper and lower rungs. The tape cables 12 are supported and stabilized by an upper hanger member 15

and a lower hanger member 16, each of which is pivotally mounted on a separate bearing 20.

As shown in Figure 2 a tape cable 12 is joined to an operating element 21 by means of flexible linear elements 22 with one linear element being connected to an upper part of the operating element and the other linear element to a lower part of the operating element. While elements 22 are shown as flexible linear elements, they could, in the alternative, comprise rigid linear elements pivotally connected to the cable 12 and operating element 21. Operating element 21 is linearly movable in a vertical direction on the inside surface of the glass plane 3 and is magnetically coupled with an actuating member 23 linearly movable in a slide 24 fixed on the outside surface of the pane.

As seen in Figure 2, if the operating element 21 is moved up or down from the position shown, the hanger members 15 and 16 will be caused to pivot on their bearings 20 to regulate the opening between the slats 10. Rotation of the hanger members from the position shown will move the edges of the hanger members and consequently tape cable 12 away from both panes 3 and 4. If the connection between the cable 12 and the operating element 21 were rigid and not pivotally connected at its ends, cable 12 will be stretched to move laterally with respect to the axis of bearing element 20, thus imparting a lateral force to the tilting transfer mechanism. This, in turn, would result in increased side loads on the bearings 20 and so increase friction losses and increase forces necessary to pivot the hanger members. The use of flexible linear elements 22, or rigid elements pivotally connected at their ends, provides a flexible connection between the operating element and the tape cable with respect to the operating element, when the hanger members pivot, thus

substantially reducing the lateral forces applied to the tilting transfer system.

The operating element 21 and actuating member 23 preferably are provided with PTFE covers 25 or other material having similar lubricating properties, to reduce friction forces between the glass surface and the element and member. In addition, the actuating member may be provided with an actuating knob 26 which may be grasped in order to move the member within the slide 24. The knob in addition, is preferably threaded into the actuating member so that the knob and actuating member may be locked into place by screwing the knob down so that it tightly engages the slide.

In some instances, because of space limitations or aesthetic purposes, it may be necessary to have the linear members completely covered by the operating element. This can be done as shown in Figure 3 by having the linear elements cross in a vertical plane. The effective length of each element remains the same as for the arrangement shown in Figure 2.

While a tape cable connected to upper and lower rungs is shown in Figures 1 to 3 to form a tape ladder, the tilting transfer mechanism shown could be utilized equally as well with tape cables which are connected to individual slats by other means. For example, small clips may be used to connect a cable directly to a slat or the cable may be provided with eyelets connecting with holes in the slats.

A further form of connection between a tape cable and operating element is shown in Figures 4 to 6 in which like parts illustrated in Figures 1 to 3 have the same reference numerals. The operating element 21, as shown, is a rigid member 40 including a lateral guide slot 41 in which is slidable a square cross-section guide pin 39 carried on a slider 43, which in turn is

joined to the cable 12 by passing the cable through grooves 44. Retaining tabs 42 are provided on the ends of pins 39. As is apparent from Figures 4 and 5, the cable 12 and the slider 43 are free to move in a transverse direction with respect to the linear movement of operating member 21, so that lateral loads will not be imparted into the system when the slats are tilted.

A still further connection between an operating element and cable is shown in Figure 7. There, the operating element 70 comprising a housing, includes a lateral guide slot 71 on the housing extending in a direction transverse to the linear vertical movement of the operating element. The cable 12 which is connected to hanger members (not shown) has a slider 73 joined thereto, the slider including a portion 74 slidable in guide slots 71. The cable 12 and connector piece are thus free to move in a transverse direction with respect to the linear movement of the operating element 70 in the same manner as with the forms of connecting means as shown in Figures 2 to 6, thus ensuring that no lateral loads are introduced when the slats are tilted. Some of the slats 110, i.e. those within the path of movement of element 70 have cut-outs 75 therein to receive the operating element 70 or part thereof.

A modified assembly is illustrated in Figures 8 to 12, in which like parts are indicated by like reference numerals plus 100. Thus, a linearly movable actuating member (not shown) is magnetically coupled with a linearly movable operating element 121 which comprises a split housing 131, forming two housing sections 132 and 133, each of which carries a magnetic 134 to cooperate with magnets carried in the actuating member so as to form a magnetic couple therewith.

As shown in Figure 8, the slats 110 adjacent the operating element 121 each have two cut-outs 135 and 136

therein, in order to accommodate the sections 132 and 133 containing the magnets 134. The portion of the slats 110 between the cut-outs 135 and 136 extends into the space between the two sections 132 and 133 forming the split housing and this portion is connected to the cable 112 by way of upper and lower rungs, as shown, or if no rungs are provided, directly to the cable 112 by clamps or other means as explained hereafter.

Thus, it is seen that by this arrangement the slats 110 are supported in the same manner as the slats 10 and that any additional structure, such as clamps clamping the upper and lower rungs to any reduced portion of the slat at a cut-out or a separate tape ladder means connecting slats 110, are not necessary to ensure vertical and longitudinal alignment of all the slats.

The tape cable 112 is connected at one point at the split housing between the sections 132 and 133 by an adhesive or any other means. Because of the extreme thinness of the split housing and the web 138 joining the two sections, the cable 112 is not depressed or displaced laterally with respect to the slats to any substantial extent, so that no undue interference would occur between the cable and the edges of the slats 110 not having cut-outs, resulting in possible deformation of the slats or increase in force necessary to tilt the slats.

Referring to Figure 9, there is illustrated a securing means for securing a slat 110 to a connecting means or tape cable 112 which comprises integral tabs 146 and 147 punched from a side portion 148 of the slat extending between the two cut-outs 135 and 136. As shown, the tabs 146 and 147 are bent over the upper rung 113 to clamp the rung to the upper surface of the slat 110. the slat is then securely clamped to the rung and prevented from longitudinal displacement with respect to

the tape ladder, which could result in an unsightly appearance of the slat 110 having the cut-outs from the remainder of the slats 110, and also prevents any sagging of the slats 110 resulting from the rungs extending over one of the cut-out areas. While the tabs are shown on the upper surface of the slat, they could instead be on the lower surface, or even one on the upper surface and one on the lower surface, the only requirement being that at least one cross-rung is securely clamped to a slat surface.

The side portion 148 of the slat preferably has a notch 149 on the edge thereof in order to accommodate the tape cable 112. This prevents the cable from binding on the slat as might occur during tilting of the slats which in turn would increase the forces required to operate the tilting mechanism.

Referring to Figures 10 to 12 there is illustrated a further embodiment of securing means in the form of a tape support pad 150. The pad 150 comprises a body member 151 having a slat engaging surface 152 and a rung engaging surface 153 including a groove portion 154 thereon. The slat engaging surface has a locking member 155 extending therefrom adapted to be inserted through an aperture 156 contained in the slat 110. Locking member 155 has a notch portion 157 adapted to engage a lower rung 114 as shown in Figure 12. The body member 151 along with the locking member 155 serves to tension the rungs by spreading them apart, which ensures that they will be held in the groove 154 and notch 157, thus fixing the tape support member with respect to the tape ladder, so that there will be no longitudinal movement of the slat 110 with respect to the tape ladder. The tape support may be provided with an arm 158 to ensure further that the upper rung 113 is held in groove 154 and to impart additional tension on the upper rung. A

notch 159 may be included on the end of the body member 151 to engage tape cable 112, to provide an even further means for preventing longitudinal movement of the slat 110 with respect to the tape ladder.

While the tape support pad 150 is shown in Figures 10 to 12 as engaging the upper surface of a slat 110, the pad could be inverted to engage instead a bottom surface of the slat.

A still further form of the tape support pad is illustrated in Figure 13. In this embodiment the tape support pad 180 comprises a body member 181 having a slat engaging surface 182 and including a groove portion 183 extending the length of the body member and adapted to have a rung therein. The body portion includes an arm portion 184 extending over the edge of the cut-out 149 contained in the slide portion of the slat between cut-outs 135 and 136. A notch 185 is included in the arm portion to provide a means for securing the slat against relative longitudinal movement with respect to the tape ladder. Groove 183 holding the rung 113 provides a further means for preventing such longitudinal movement. The body member 181 includes a locking member (not shown) which extends from a slat engaging surface to be locked into an aperture in the slat 110 in the same manner as with the embodiment of Figures 10 and 12. Again, the tape support pad 180 may engage either the top or bottom surface of a slat.

Figures 14 to 16 illustrate a further form of operating element 190 having two housing sections 191 and 192 spaced apart and joined by a thin centre section 193. An upwardly vertically extending arm 194 is connected at one end to centre section 193 and at its other end 195 to the tape cable 112. A downwardly extending arm 196 is connected at one end to centre section 193 and at its other end 197 to a tape cable

112. This particular construction provides a minimum of lateral displacement of the tape cable due to the presence of the operating element.

The housing sections containing the magnets comprise a band 198 surrounding edges of the magnets 199 on each housing section. Each band has a shoulder 200 engaging in one side thereof a face 201 of the magnet and engaging on an opposite side thereof of pole piece 202 which has a groove 203 therein to accommodate the shoulder 200. The magnetic forces acting between the magnet 199 and pole pieces 202 pull the two parts together against the shoulder 200 so as to hold the parts within the band 198. This particular construction eliminates the need for any cover on the housing containing the magnets which would act to increase the air gap between the magnets in the operating element and the magnets in the actuating member, resulting in a weak magnetic coupling between the two elements.

A stroke limiter construction is illustrated in Figure 17, where means are provided for guiding and limiting the linear movement of the actuating member. As shown, the actuating member 123 is connected to the connection means or tape cable 112 on one side of a pane 103. An actuating member 123 is shown prior to being magnetically coupled to the operating element on the opposite side of the pane 103 from the operating element. The actuating member 123 contains two mounting sections 161 and 162 similar in size and shape to the housing sections 191 and 192 of the operating element 190 and contains magnets therein in the same manner as the operating element. The space 163 between the mounting section forms a track or guide to receive a stroke limiter 165 which is affixed to the side of the pane 103 opposite the operating element 190. The top 166 and bottom 167 of the housing of the actuating

member serve as stops to limit linear movement of the actuating member. In this manner, the actuating member 123 is guided as it is moved to operate the tilt mechanism and the guiding action, as well as the stop provision, ensures that the actuating member may not be moved beyond the point where the magnetic coupling between it and the operating element 190 might be broken.

Referring to Figure 18 there is illustrated an arrangement of magnets in the operating element 190, looking at the element in the direction of the arrow 230 in Figure 20. Element 190 may also be referred to as the inside magnet assembly, since it is adapted to be positioned inside a window unit between glazing. As shown, each housing section 191 and 192 contain a plurality of vertically arranged magnets with the polarity of the magnets at one vertical level in one housing section being opposite to that of a magnet of the same vertical level in the other housing section.

The arrangement of magnets in the actuating member 123 is shown in Figure 19 is similar to that in operating element 190 of Figure 18, in that each mounting section 161 and 162 contains a plurality of vertically arranged magnets, with the polarity of a magnet at one vertical level in one mounting section being opposite to that of a magnet at the same vertical level in the other mounting section. The actuating member 123 may be considered an outside magnet assembly, since as shown in Figure 20, it is positioned exterior of a window unit and on the opposite side of the pane 103 from the operating element 190. The view illustrated in Figure 19 is in the direction of the arrow 231 away from the pane towards the exterior of a window unit.

When the operating element 190 and actuating member

123 each have the magnets arranged as shown in Figures 18 and 19, and when the elements are positioned on opposite sides of the pane 103 as shown in Figure 20, it is seen that the polarity of a magnet at one vertical level of the housing section will be opposite to the polarity of a magnet at the same vertical level of the opposite mounting section. This arrangement maximizes the magnetic coupling force between the operating element and the actuating member while at the same time tending to keep these elements in line with one another, so that there is little tendency for one element to rotate with respect to the other element, if an actuating force is applied off-centre on the actuating member 123.

The various magnetic actuating mechanisms illustrated in Figures 9 to 20 are, like those illustrated in Figures 1 to 8, applicable for use in unglazed, single glazed, or even triple glazed units in addition to the double glazed units as described.

While in the above description the pivoted hanger members have been indicated as separate from the top and bottom slats, they could, of course, form part of a special top or bottom slat or a member which is similar thereto.

C L A I M S

1. A tilting transfer mechanism for a venetian blind assembly having a plurality of slats (10, 110), at least one tape cable (12, 112) forming part of supporting means, supporting said slats, pivotal upper and lower hanger members (15, 16) supporting each tape cable, upper and lower bearing elements (20) pivotally supporting said upper and lower hanger members respectively, characterised in that said tilting transfer means includes a linearly movable operating element (21, 70, 121, 190) and connecting means (22, 40 to 44, 71 to 74, 194 to 197) operatively connecting said linearly movable operating element with said hanger members, whereby linear movement of said operating element will cause said hanger members to pivot on said bearing elements to tilt said slats.

2. A mechanism according to claim 1, characterised in that said tape cable (12, 112) forms part of said connecting means.

3. A mechanism according to claim 1 or 2, characterised in that said connecting means includes flexible elements (22) or pivotally mounted rigid linear elements (40 to 44, 71 to 74, 194 to 197) connecting said operating element with a tape cable.

4. A mechanism according to claim 3, characterised in that said flexible linear elements (22) are connected to the tape cable and the operating element at such points that they cross in a vertical plane (Figure 3).

5. A mechanism according to claim 1, characterised in that said connecting means comprises, in part, a

separate drive cable connected to said upper and lower tape hanger members and to said linearly movable operating element.

6. a mechanism according to claim 5, characterised in that a portion of the drive cable engages a surface of a hanger member spaced from the pivot axis of the hanger member and including, in addition, a drive cable guide for guiding the drive cable near the hanger member to maintain constant tension in the complete drive cable including the portion of the drive cable on the side of the operating element in the direction of linear movement of said operating element.

7. A mechanism according to claim 6, characterised in that said guide comprises a saddle-shaped wire hanger having two spaced parallel upstanding portions with one of said portions forming a guide arm, and the other of said portions forming a bearing support for one of said hanger members.

8. A mechanism according to any preceding claim, characterised in that the operating element has a guide means (41, 71) extending in a direction transverse to the direction of linear movement of the operating element and in that said connecting means includes a slider (39, 74) slidable in said guide means, whereby said connecting means may move in a direction transverse to the linear movement of the operating element during operation of the mechanism.

9. A mechanism according to any preceding claim, characterised in that said blind assembly forms part of a window unit (1) including a pane (3, 103), in that said operating element (21) is slidable in a linear

direction on one side of said pane, and in that an actuating member (23) is linearly slidable on the opposite side of said pane from said operating element and is coupled with said operating element.

10. A mechanism according to claim 9, characterised in that said pane forms part of a hermetically sealed window unit (1) with said venetian blind assembly (2) being positioned within said unit.

11. A mechanism according to claim 9 or 10, characterised in that said operating element (21) is magnetically coupled with said actuating member (23).

12. A mechanism according to claim 11, characterised in that said operating element (21) and actuating member (23) each include one or more magnets therein.

13. A mechanism according to claim 12, characterised in that said operating element includes an inner housing (121, 190) containing at least one magnet (134, 199) with said inner housing being connected to said connecting means (112) and wherein said actuating member (123) includes an outer housing containing at least one magnet.

14. A mechanism according to claim 13, characterised in that a guide (24) is adapted to be fixed to the window unit and in that said outer housing may slide in said guide.

15. A mechanism according to claim 13, characterised in that a stroke limiter (165) is adapted to be affixed to said window unit and in that the

actuating member (123) is positioned adjacent and movable with respect to the stroke limiter, stop means (166,167) on the actuating member limiting movement of the actuating member with respect to the stroke limiter, which is, preferably, positioned between the magnets of the actuating member.

16. A mechanism according to any one of claims 10 to 15, characterised in that said operating element comprises a split housing (131, 190) forming two similar housing sections (132, 133, 191, 192), in that each housing section has at least one magnet (134, 199) therein, and in that said housing is connected between said sections to said connecting means (112).

17. A mechanism according to claim 16, characterised in that said split housing is formed by a notch in said housing on a side thereof facing said slats.

18. A mechanism according to claim 17, characterised in that said housing has an upwardly extending vertical arm (194) and a downwardly extending vertical arm (195) each connected at one of its ends to said housing between said sections and each connected at the other of its ends (195, 197) to said connecting means (112).

19. A mechanism according to any one of claims 16 to 18, characterised in that each housing section comprises a band (198) engaging an edge of a magnet (199), in that the band has a shoulder (200) on a portion thereof having a side engaging a face (201) of a magnet and having, in addition, a pole piece (202) engaging on an opposite side of said shoulder from the

side engaging the face, whereby said pole piece is magnetically attracted to said magnet, such that the shoulder holds the magnet and pole piece in said band.

20. A mechanism according to claim 19, characterised in that said pole piece (202) has a groove (203) therein to receive said shoulder.

21. A mechanism according to any one of claims 16 to 20, characterised in that said actuating member (123) comprises a split mounting having two similar mounting sections (161, 162) substantially equal in size to the two housing sections (191, 192) with each said mounting section containing at least one magnet therein, with a magnet in a housing section being magnetically coupled with a magnet in the mounting section.

22. A mechanism according to claim 21, characterised in that each said housing section and each said mounting section has a plurality of magnets vertically arranged therein, with the number of magnets in the housing section being equal to the number of magnets in the mounting section, and in that the polarity of the magnets at one vertical level of one housing section is opposite to the polarity of a magnet in the same vertical level in the other housing section, and in that the polarity of a magnet at one vertical level in one housing section is opposite to the polarity of a magnet in the same vertical level in the mounting section to which the magnet in the housing section is magnetically coupled.

23. A mechanism according to any one of claims 10 to 22, characterised in that the operating element (190) includes an inner housing having tie points (195, 197)

on the top and bottom sides thereof connecting said housing to a part of the connecting means (112).

24. A mechanism according to any preceding claim, characterised in that some of said slats (110) over at least the path of linear movement of the operating element (70, 121) have one or more cut-outs (75, 135, 136) therein, to receive said operating element or part thereof.

25. A mechanism according to claim 24, when appendant to any one of claims 16 to 23, characterised in that said some slats have two cut-outs (135, 136) and in that these slats are secured by securing means to said tape cable (112) at the widest portion (148) thereof between said cut-outs.

26. A mechanism according to claim 24 or 25, characterised in that said operating element is connected to said tape cable (12, 112), said tape cable forming part of a tape ladder that has a plurality of upper rungs (13, 113) and lower rungs (14, 114) which supports said slats, and in that means (146, 147, 150 to 159) are associated with some of said slats for holding an upper and lower rung to the top and bottom surface of a slat adjacent a cut-out (135, 136) formed in the edge of said some slats.

27. A mechanism according to claim 26, when appendant to claim 25, characterised in that said widest portion (148) of each slat having cut-outs has a notch (149) on the edge thereof to receive a tape cable.

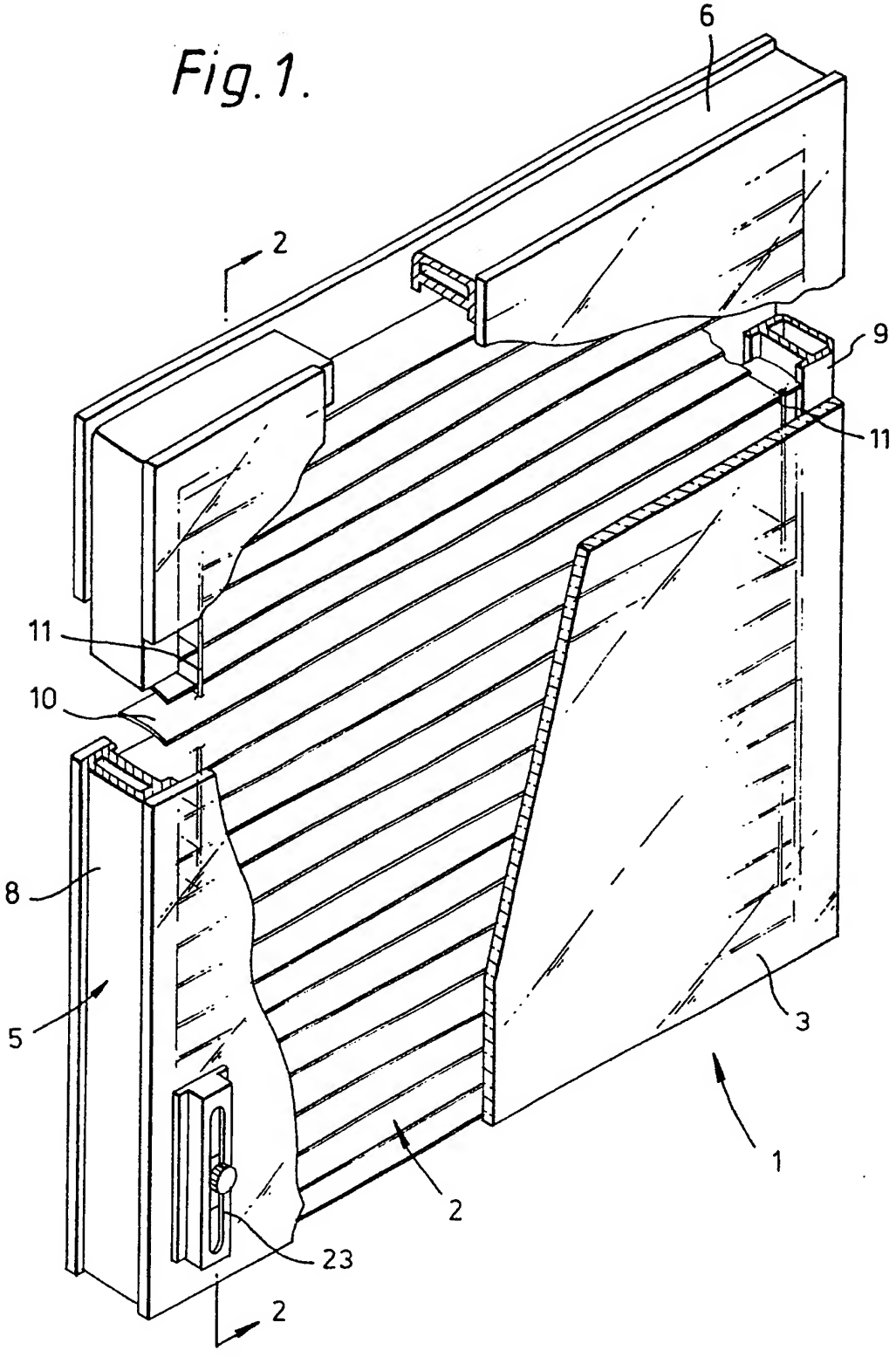
28. A mechanism according to claim 26 or 27,

characterised in that said means associated with some of the slats comprises a pad (150) engaging the surface of a portion of a slat extending between said cut-outs (135, 136) with said pad having a rung-engaging surface (153) including a groove portion (154) and a slat-engaging surface (152) and a pad fixing means (155) for fixing said pad to the surface of the slat, whereby said groove portion will engage a rung (113) to prevent longitudinal movement of the slat with respect to said tape ladder.

29. A mechanism according to claim 28, characterised in that said pad fixing means includes a locking member (155) extending through an aperture (156) in the widest portion of the slat having cut-outs, whereby said tape support pad is affixed to a surface of the slat and in that said fixing means includes a notch (157) for engaging a rung (114) opposite the rung (113) engaged by the groove portion (154), such that said tape support pad spreads the upper and lower rungs engaged thereby to tension the same whereby the rungs are securely held in the groove portion (154) and in the notch portion (157).

30. A mechanism according to claim 22, characterised in that the housing sections and mounting sections each include at least four magnets, and in that the magnets at the ends of the vertical arrangements are approximately half the size of the intermediate magnets.

Fig. 1.



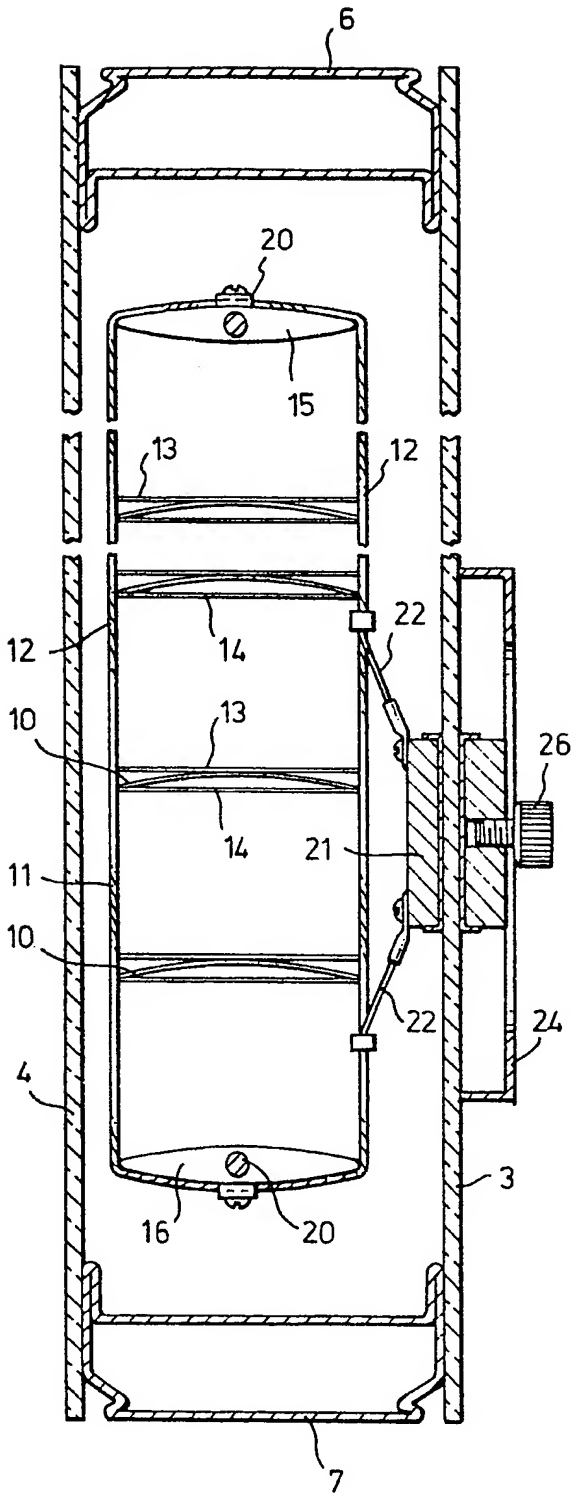

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Fig. 2.

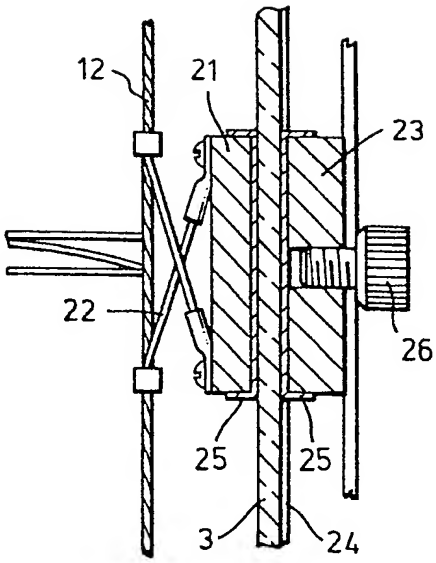
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Fig. 3.

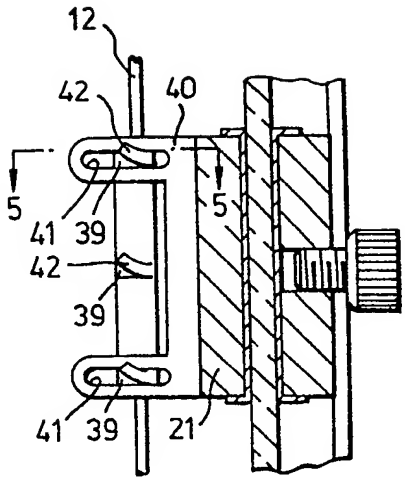

Fig. 4.

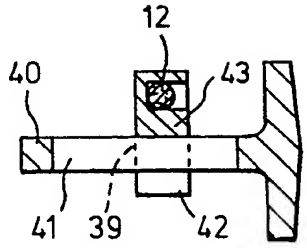

Fig. 5.

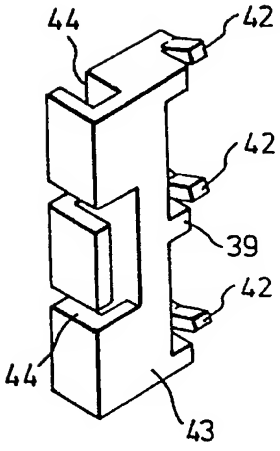

Fig. 6.

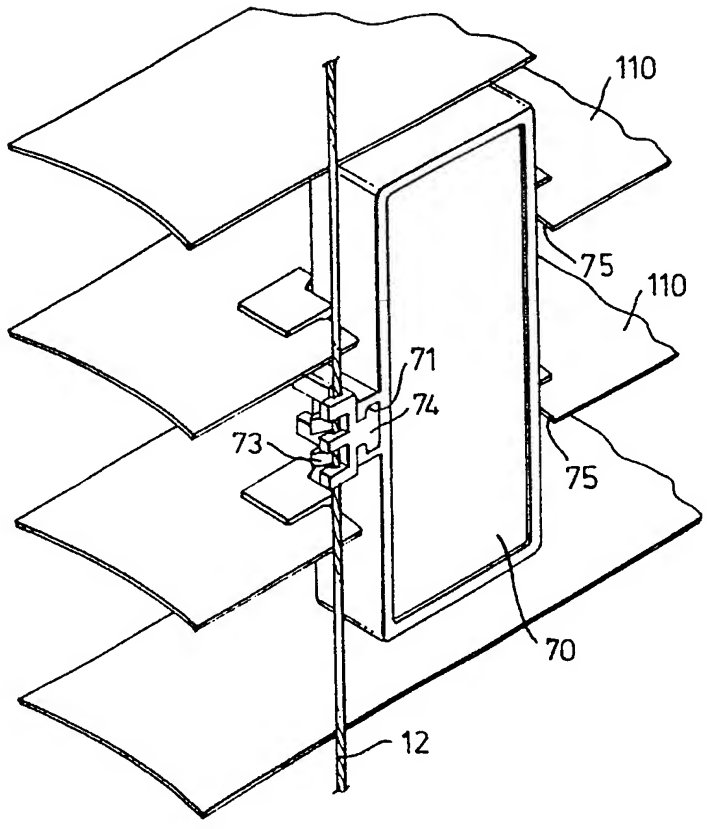

Fig. 7.

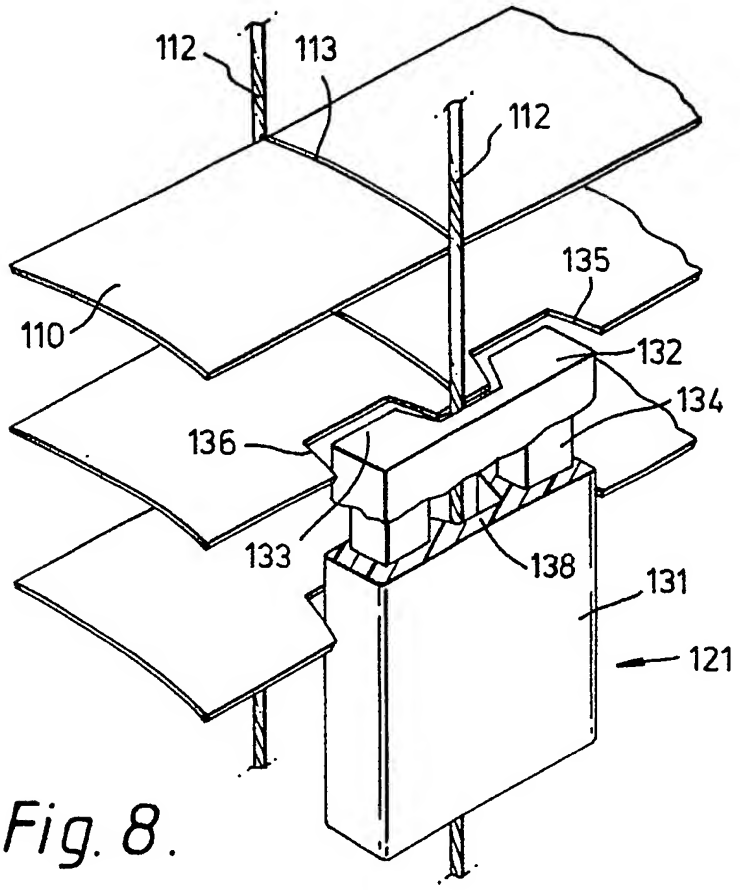
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Fig. 8.

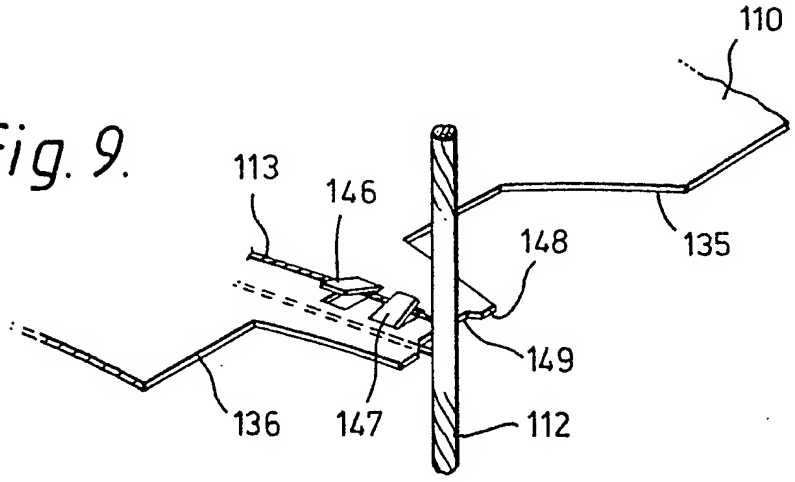
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Fig. 9.

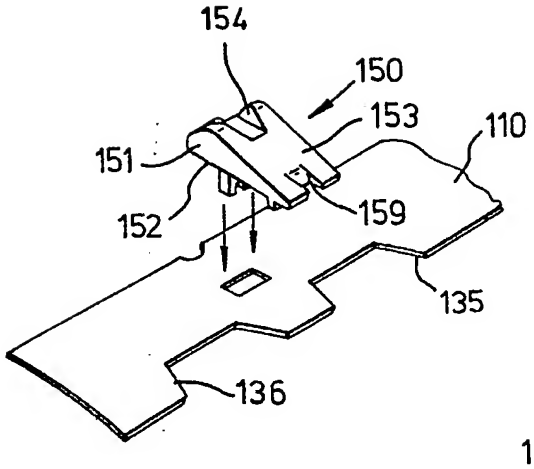


Fig. 10.

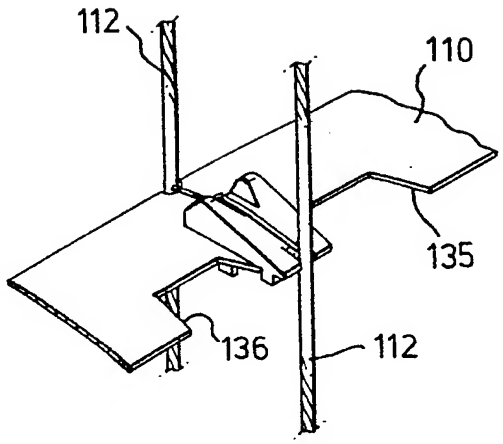


Fig. 11.

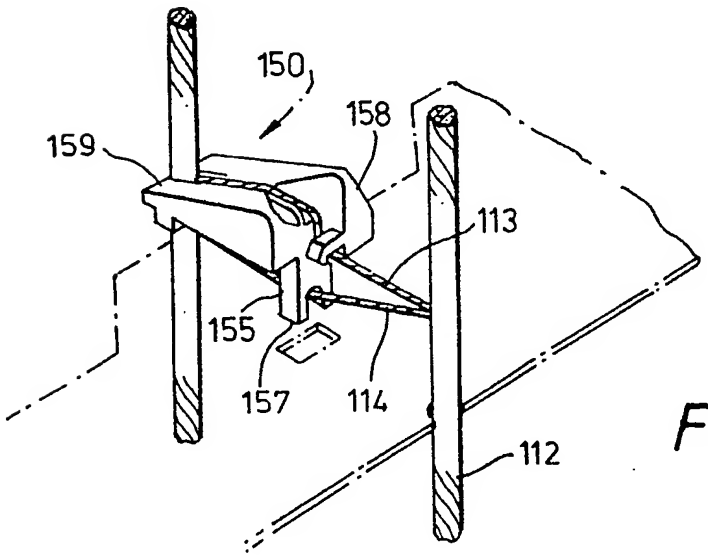


Fig. 12.

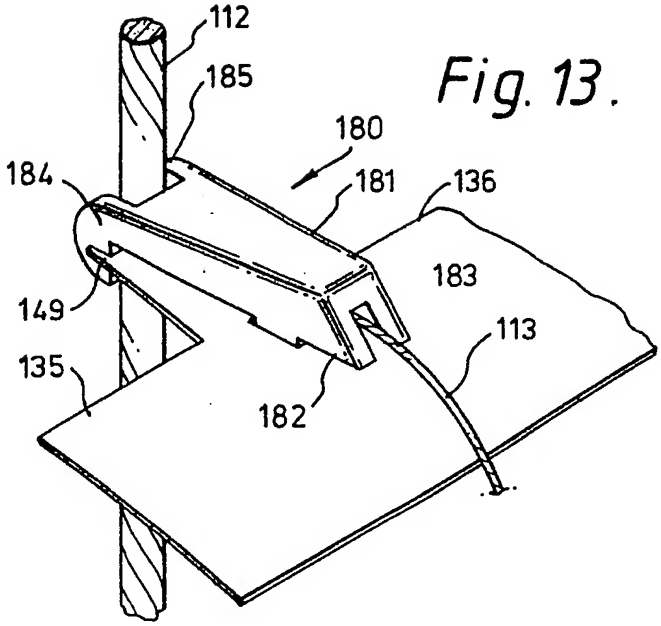


Fig. 13.

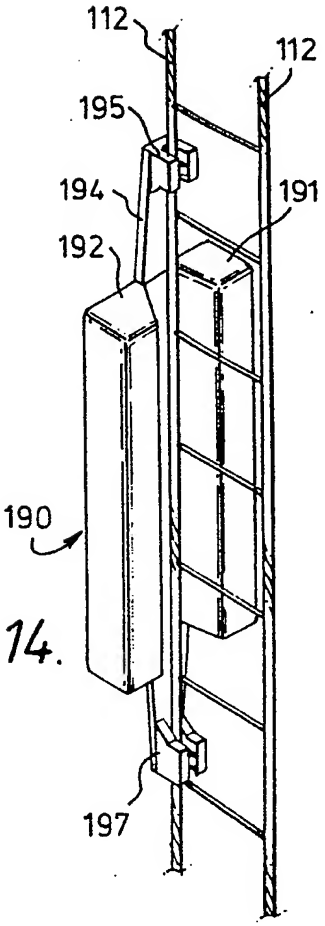


Fig. 14.

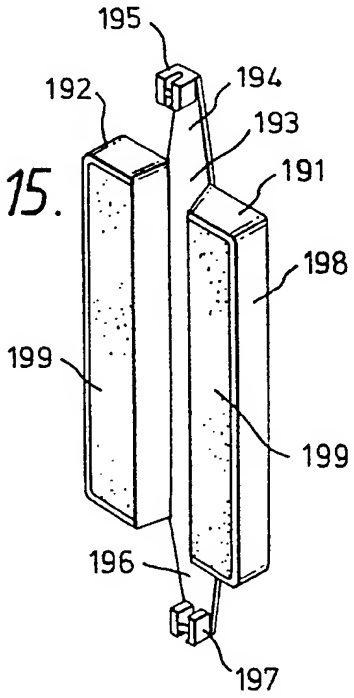


Fig. 15.

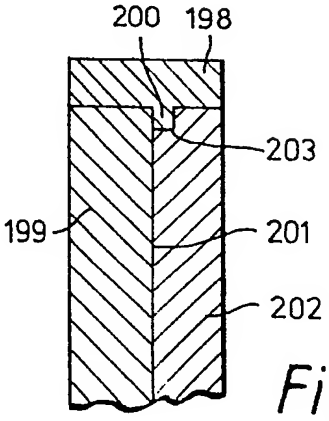
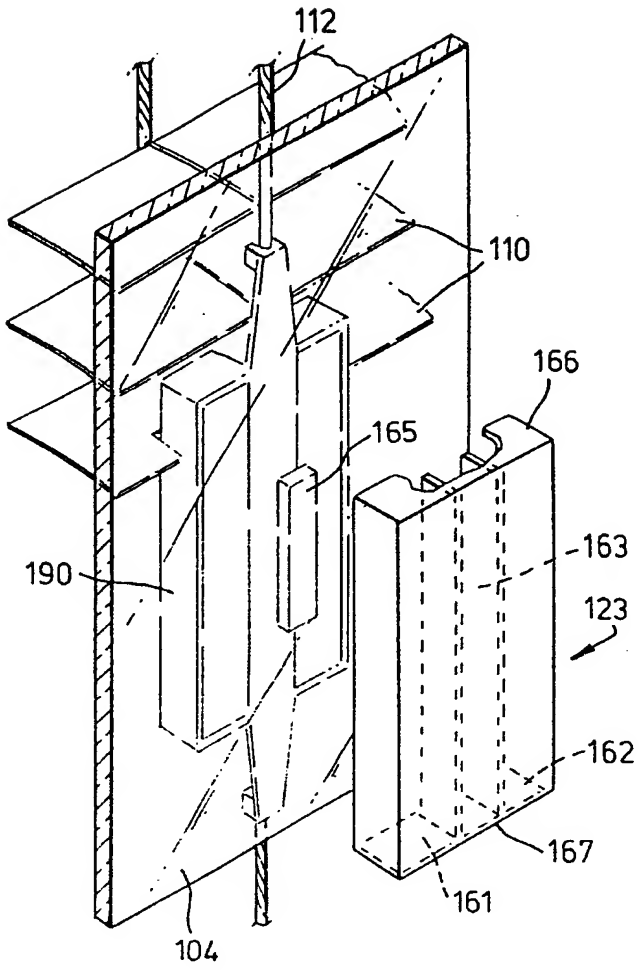


Fig. 16.

Fig. 17.



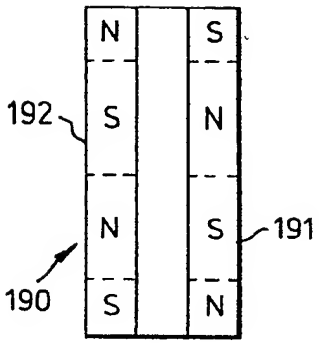


Fig. 18.

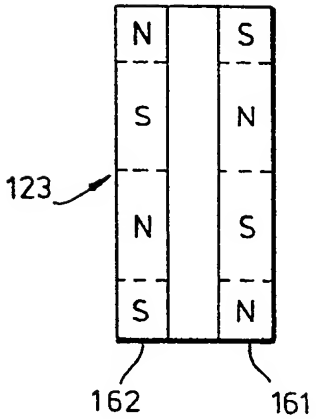


Fig. 19.

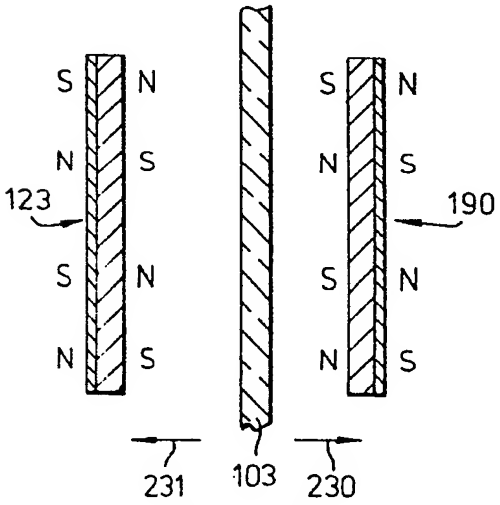


Fig. 20.

0082723

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 82 30 6844

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	FR-A-2 095 958 (INTERVER) *Pages 3,4; figures 1,2*	1,9,10,11,12,15	E 06 B 9/264
A	US-A-3 719 221 (HANSON) *Column 4, lines 53-65; figures 1-5*	2	
A	US-A-3 292 309 (HORNER) *Column 3, lines 4-75; column 4; column 5, lines 1-21; figures 1-9*	1,8,9,10,11,12,13,14,15	
A	FR-A-1 384 189 (GOTOH) *Pages 1,2; page 3, paragraphs 1,2; figures 1-6*	11,12,13,22	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) E 06 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21-03-1983	VIJVERMAN W.C.

CATEGORY OF CITED DOCUMENTS

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P : intermediate document

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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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